The Effect of Lacto-Vegetarian Diet with special reference to Sattvic Diet on Mood and Meditation Practices

Synopsis

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1.Introduction

In the present scenario, depression and anxiety have risen as the most common mental health morbidities. These mood disorders have the potential to evolve and mutate into far more dangerous illnesses, like psychosis and schizophrenia (Arsenault Lapierre et al., 2004). Usually anxiety and depression co-exist (Park and Kim, 2020) and very often, prone to relapses (Ali *et al*., 2017). The overall burden of anxiety and depression has been steadily increasing and now exceed other major diseases (Tyrovolas *et al*., 2020). In 2017, WHO estimated mental disorders accounted for about 14% of worldwide years lived with disability (depression alone accounted for over 50 million cases and anxiety disorders about half of that). Alarming projections anticipate that by the year 2030, mental health diseases will dethrone the rest to become the leading cause of global disease burden. A recent meta-analysis of 12 large community-based studies conducted during the Covid 19 outbreak (between January 2020 to May2020) reported that pandemic was responsible for seven-fold increase in the incidence of depression in general population. These estimates clearly show that depression is attaining the form of a mental pandemic which is resulting in social and physical disability.

These mood disorders can begin in childhood as early as three years of age, peak up in adolescence, and can last a lifetime (Thapar and Riglin, 2020). Sue *et al.*,2015, proposed four dimensions namely biological, psychological, social and sociocultural for etiology of depression that interact in various combinations leading to depressive episodes. The most common hypothesis about the phenomenal rise of mental disorders bends in favour of the modern lifestyle and the "stressogenic" environment we are used to living in (Grosso *et al.*,2021). In the previous 50 years, there has been a massive shift in the lifestyles due to urbanization and the technological improvements which has led to the so-called "information revolution". The prevailing modern lifestyle scenario is characterized by faulty food habits, longer days (due to night lights) and unending long screen-hours accompanied by the pressure from a competitive society (Hidaka.,2012). The cumulative burden finally results in a mismatch with human genetic heritage, largely unchanged from our ancestors. The shift away from traditional diet and lifestyles has been attributed to increased incidence of depression and other mental disorders. (Logan.*et.al*,2012). It is rather difficult to gauge the various reasons for such an incremental rise in the prevalence of mental health disorders. However, from an epidemiological point of view, a better

knowledge and awareness about these conditions would allow for a timely recognition and consequently, a higher rate of diagnosis. Compared with normal population, individuals with mental disorders have higher chances of morbidity and mortality caused from communicable and non-communicable diseases. (Gupta & Gupta.,2021).

Although it is difficult to determine the complex factors leading to mental illness, there is mounting data to support strong connections between poor diet and exacerbation of mood disorder including anxiety, depression and cognitive impairment (Roger et al.,2019; Attuquayefio *at al.*,2017). Diet has recently received attention as a promising intervention target for prevention of depression as well. Mood and emotions are regulated by food intake, and it also has a bearing on the food choices made by the person. (Gibson *et al*.,2006) Individuals with severe mental disorders consume diets that are more energy-dense, highly processed, higher in salt and contain less fruit and vegetables, when compared to general population (Dipasquale *et al*., 2013; Cebrino *et al.*,2020). Excessive intake of foods rich in fats and sugar lead to inflammation, a characteristic feature of mental disorders (Firth et al.,2018). Marozoff *et al*.,2020 in a Canadian study reported that diet quality was inversely proportional to the number of physician visits made by individuals suffering from depression thereby indicating fewer episodes of illness in Canadian nationals who were on wholesome diets .Thus, increased intake of healthy and wholesome diet comprising of fresh fruits, vegetables and whole grains reduce likelihood of depression(Lai *et al.*2014) and lead to higher levels of reported happiness and mental wellbeing.(Emerson and Carbert.,2019; Fresan *et al*.,2019; Conner *et* al.,2017). Balanced diet and nutrition are of paramount importance throughout the lifespan. Diet and nutrition are increasingly becoming targets for research in mental health because like the rest of the body, brain is also nourished and maintained by the nutrients that are consumed in the diet and digested in the gut. Traditional diets tend to be rich in food items which confer anti-depressant properties as they contain soy foods, turmeric, green tea, blueberry, pomegranate, nuts and honey which contain polyphenols and phytochemicals (Ng., 2006.; Pham.,2014). Certain mineral and vitamins such as Magnesium, Zinc, Vitamin C, Folic Acid, and Vitamin B12 have been increasingly associated with improving symptoms of depression and providing protection against it. There have been great strides in the recent years in the field of nutrition psychiatry to connect nutrition with mental wellbeing. Since food is consumed as a whole and one

seldom takes nutrients separately, it's prudent to take into consideration the entire dietary pattern when trying to establish link between food and disease (Arab *et al.*,2019). In recent times, a great volume of studies have conclusively shown that vegetarian dietary pattern (no animal foods with a exception of dairy) provide a wide a variety of health protecting components including fibre, phytoestrogens, antioxidants, flavonoids, carotenoids, other phytochemicals, and omega-3 fatty acids. Vegetarian diets with variety of unprocessed and natural foods help to reduce one's vulnerability towards chronic diseases such as cardiovascular disease, diabetes mellitus, chronic kidney disease, and all-cause mortality. The benefits of a vegetarian diet are mainly related to improving certain metabolic parameters such as oxidation balance, lipid profile, and glucose homeostasis. In contrast to omnivores, mortality rates are 12% lower for vegetarians (Orlich.,2013). Adhering to well - planned vegetarian dietary pattern helps to boost one's immunity and possibly provide greater longevity. Recently, vegetarian diets are being recognised to boost one's mood as well. Following a vegetarian diet has shown to significantly lower the mood scores for depression and anxiety (Olabi et al.,2015; Beezhold.,2012). There is enough scientific evidence to prove that most benefits of vegetarian diets are mediated by bacteria that colonize the gastrointestinal tract, referred to as '*gut microbiota'*. (Rosario. V.A., et al.2016). More and more evidence has shown that their exist a bidirectional communication between our gut and brain commonly referred to as the Gut Brain Axis (Dinan *et al.*,2015). The key stake holders of this bi-directional communication are the millions of microbes, (along with their metabolites and genes collectively known as 'Gut microbiome') that harbour the gastrointestinal tract and create very individualistic and distinct environment for each individual while interacting with the host and its environment (Sheth.,2021). Gut microbiota impacts mental health through pathways which are mediated by neurotransmitters (Luck *et al.*,2021). The interaction between gut microbiota and neurotransmitter is a bilateral one. Gut microbiota regulates the level of many neurotransmitters like serotonin (Yano *et al*.,2016) and dopamine in the host (Luck *et al.*,2021) which are associated with mood. The diversity and richness of the gut microbiota is modulated to a great extent by host's dietary pattern. Vegetarian diet is also a diet pattern. Intake of vegetarian diet is known to swing the ratio in favour of beneficial microbes ensuring host's mental and physical wellbeing. Probiotic supplementation is a novel therapy known to improve diversity and restore balance of microbiota hence making a very strong case for an important non-pharmacological and 'fit

for all' therapy for addressing mood disorders, gastrointestinal health and immunological issues. (Halloran and Underwood.,2019) Though, conventional pharmacological therapies including anti-depressants have been sought to manage and cure mental disorders, their use have been far from satisfactory as the potential side effects involved bring in more ill health to the already miserable. The prolonged use of anti-depressants causes increased dependency on these medicines, higher relapse rates, and weight gain, besides poor quality of life. Anti-depressants are known to cause decreased satiety, increased hunger, and cravings for sweet foods and drinks (Treuer.,2009). The inability of modern medicine to provide complete 'Health to all' has prompted more to take a relook towards Alternative and Traditional system of Medicine like Ayurveda, Siddha, Unani, Homeopathy, Acupressure and Chinese Traditional Medicine prevalent in eastern part of the World. Traditional medicine involves a varied and holistic approach towards disease, its prevention and treatment.(Qureshi & Al-Bedah,.2013). Indigenous to India, Ayurveda is the traditional system of medicine which dates to 5000 years. Globally, Ayurveda is a form of Complementary or Alternative medicine in a position where it helps when the regular system of health care fails. (Jayasundar.R.,2010) Ayurveda has for long proposed a mechanism of causation for depression, which is strikingly similar to a new biomedical understanding that links mood disorders like depression to a dysregulation of the Gastrointestinal tract. (Sheth.,2021). WHO accepts Ayurveda as a *Whole System of Medicine* that adopts a holistic and multidimensional approach towards health and wellbeing encompassing mind, body, and soul. WHO recognised as early as in 1960s and still confirms even after four decades that recovery rate from mental disorders is higher in developing countries like India as compared to other developed nations due to the availability of more pluralistic medical environment (Halliburton.M., 2020) of which Ayurveda is an essential part.

Ayurvedic principles identifies '*Ahara'*(diet) as one of the most important pillar (*Upastambh*) of life playing a vital important role in nourishing mind, soul and the body for achieving health, wellbeing and happiness. (Sheth H., *et al*.,2021) Ayurveda examines the whole body, mood and mental wellbeing (behaviour, thoughts and feelings) as a product of the diet consumed. (Sarkar *et al*.,2015). Ayurveda contains a myriad of knowledge on health sciences. Accordingly traditional foods and their dietary guidelines are prescribed in Ayurveda. There is close similarity in ayurvedic dietetics and traditional foods owing to which many of the traditional health foods in India can easily pass as ayurvedic foods.

In ancient India food is revered as God and alternately it is stated that 'Food is medicine'. In Ayurvedic text *Vaidyajeevanam*, dietary principles of Ayurveda are discussed and it mentions that "the need of taking medicine is eliminated by making wise food choices". Diet has intimate connection with the mind. Mind is formed out of the subtlest portion of food. (Lad and Lad.,2007). Diet and nutrition are increasingly becoming targets for research in mental health because superficially like the rest of the body brain is also nourished and maintained by the nutrients consumed in the diet and digested in the gut. Ayurveda recommends a *Sattvic diet* one which is basically a diet, that is plant based, rich in wholesome cereals and grain, fresh, fruits, vegetables, nuts, milk its products, essential fats, prepared fresh and consumed mindfully in moderation. Sattvic diets helps in treating mood disorders as it helps in restoring harmony and balance in the mind.(Frawley.,2004). In modern parlance a *Sattvic diet* is a lacto-vegetarian diet which offers all the benefits typical of a vegetarian diet which helps to keep one physically and mentally healthy by balancing the health of their microbiota. Ayurveda recommends Sattvic diet to seekers of knowledge and spiritual aspirants. (Lad.,2007) As per Ayurveda, the purpose of food was not merely for bodily strength or to increase longevity but to purify mind and consciousness. Ayurveda is based on doctrines that understand the universe from both physical and spiritual perspectives, it also encompasses mind and consciousness in its concept of health and disease management. In fact, it uses both physical and metaphysical methods such as yoga and meditation in its therapeutic management. Ayurveda understands the human system as a network of relationships that includes consciousness in a fundamental way. (Jayasundar R.,2010). Ayurveda considers the development of consciousness to be essential for optimal health and mentions meditation as the main technique for achieving this.(Sharma *et al*.,2007) Meditation as a mind-body practice is practiced by the many to improve health (Clarke et al., 2018), to train and develop mental attributes of attention such as sustained focus, nonjudgment, and compassion to both internal and external stimuli (Lutz *et al*., 2015; Kabat-Zinn, 2013; Gunaratana, 2010;.) However, the physical and mental benefits attained by practice of meditation are the by-products, the real aim of meditation is to meet the spiritual needs of the individual. The beneficial effects of meditation practices appear to be mediated through an interaction between the autonomic nervous system and endocrine system, wherein secretion of different hormones may be playing an important role. The evidence available indicates that changes associated

with endocrine function following meditation correspond with improvements in mental health. (Sakshi.,2020). It is rather interesting to note that all the major hormone secreting glands are strategically placed on or around the Chakras or energy centres of the body and thus, activated in a positive way to further contribute in conferring the physical and psychological benefits of meditation.

The present review work suggests that diet is the main modulator of individual's physical wellbeing and mood. There is a rich volume of studies that have assessed and explored the beneficial effects of meditation on different facets of health. However, the relationship between diet and meditation has not been explored by medical sciences where effect of different type of diet on meditation practices of the individual has been studied. Thus, the proposed study is taken to study the role a diet plays and effects mood and meditation practice of the person.

2. Review of Literature

2.1. Western Diets, Mood disorders and Associated Health complications

Economic growth and affluence have changed the nutrition pattern, which is now synonymous with increased intake of total and saturated fat, red meat, as well as preserved and other processed foods of animal origin. Financial prosperity also empowers people to consume ready to eat refined foods, including snacks, beverages, and major meals with high glycaemic index, fat and salt content. These foods are characteristic of a Western diet that are micronutrient deficient (omega-3 fatty acids, vitamins, antioxidants, and amino acids), high in refined carbohydrates and salt, lower in monounsaturated fat and linoleic acid when compared to a prudent traditional diet. Growing popularity and global acceptance of the Western diet is associated with high prevalence of non-communicable disease as obesity, cardiovascular diseases, type 2 diabetes mellitus, cancer, liver and gastrointestinal diseases, bone and joint diseases, degenerative diseases of the brain, and psychological disorders, including anxiety and depression both in developed and developing nations. (Fedacko *et al*., 2022). A myriad of studies have shown that individuals with mood disorders consume diets that are more energy-dense, highly processed, higher in salt content and contain less fruit and vegetables and low in fibre and omega three fatty acids as compared to general population (Cebrino *et al*.,2020; Jacko *et al*.,2020).Such diets are typically referred to as Western Diets.(Fedacko.,2022). An increasing shift towards western diets is leading to move away from traditional diets and its hidden treasures of health benefits. The shift away

from traditional diet and lifestyle has been linked to increased rates of depression and other mood disorders. (Wallace *et al*.,2019; Attuquayefio *et al.*,2017; Logan.*et.al*,2012; Holford.,2003.)

Dry weight of the brain is composed of 60% fat and hence the fat we eat may be directly affect the structure and substance of the brain. Twenty per cent of the fat in our brain is made from the essential fatty acids omega-3 and omega-6, which must be taken from outside through diet. Western diets are known to be low in neuro protective omega-3 fatty acids and rich in saturated fats. The typical Western diet is estimated to entail an omega-6 to omega-3 ratio of 15–20:1 which is undesirable for proper mental health and mood. Unequal intakes of omega-3 and omega-6 fats are implicated in several mental health problems, including depression, and concentration and memory problems. (Srikanth.N.,2018., Jacka *et al*.2010). Thus, depressed patients showed lower omega three to omega six ratio when compared with healthy adults. As, most of the meta-analysis with Omega-3 supplementation in depressed subjects could not conclusively show any efficacy it is most prudent to suggest that requirements of omega -3 should be met through dietary sources such as nuts (walnuts, peanuts), seeds like chia, flax and kidneys beans to name a few.

Gut Microbiome has emerged as the biggest modulator of individual's health and disease status. Consumption of Western Diets is associated with lower microbial complexity which is known to cause obesity-related disorders (Le Chatelier *et al*., 2013). A Korean team of researchers demonstrated clearly intake of high fat diets cause alteration of the gut microbiota composition that leads to inflammation by increasing endotoxin through TLR4 induction, thereby accelerating obesity (Kim., *et al* 2012).

Non vegetarian food is another food item which increases fat content of western diets. Ruminant meat is abundant in trans unsaturated fatty acids, and its consumption is found to be related to mood disorders like depression by Sanchez-Villegas in 2009.

Mood Disorders and cognitive impairment arise both in animal models and humans because of consuming a Western dietary (WD) pattern, characterized by daily high intake of saturated fats and refined carbohydrates ultimately leading to overweight and obesity. Long-term exposure to highly palatable foods typical of WD can induce addictive-like eating behaviours and may lead to substance use also. The habitual intake of Western diets is responsible for altered levels of neurotransmitter- in the body as well (Morris *et al*.,2015).

Hypothalamus is an appetite regulator, and it is responsible for eating behaviour. Hippocampus is also entrusted with the task of decision making related to ingestion of food that is, when to start eating and stop the same. (Parent *et al*., 2014). Major role of hippocampus of the brain is associated with memory and cognition function tasks. Obesity leads to inflammation of certain hypothalamic regions that are responsible for causing dysregulation of the sensitive energy homeostasis in the brain, inducing insulin resistance (Seong et al., 2019). In a preclinical trial when mice were fed on a high fat diet for 10-week period, it affected the hypothalamus area of the brain that led to dysregulation of endocrine secretion of hormones like Leptin and Insulin.

The shift in energy homeostasis coupled with increased hunger (hyperphagia) caused weight gain, depressed mood, increased neuroinflammation finally leading to onset of Alzheimer's diseases. (Lee *et al.*,2018). Moreover, the specific nutrients like excessive fat and refined sugar in the western diets could lead to oxidative stress in brain metabolism, producing neurochemical modifications in the hippocampus, cortex, and hypothalamus (Lizarbe *et al*., 2019). When the vicious cycle is established, hippocampal dysfunction not only affects appetite and decision making, but also begins to affect cognition (Beilharz et al., 2015).

A recent meta-analysis involving 41 studies found impairment of tasks which involved Hippocampal dependent forms of cognition (Abbott et al., 2019). Francis and Stevenson (2011) for example showed that healthy undergraduate student participants with high self-reported fat and refined sugar intake were impaired on memory tasks that were sensitive to hippocampal function.

In addition, a human trial has demonstrated overall decreased volume of the left hippocampus when the 60–64-year-old men subjects were on a diet rich in fat. (Jacka *et al*., 2015). Anxiety related behaviours, neurogenesis, memory, and spatial learning are also affected in both humans and rodents when on high fat and sugar diet(Ferreira *et al*., 2018). High fat and sugar diets also lead to worsening of mood disturbances coupled with lowering of Serotonin levels in the brain of the mice(Kim et al.,2013 and Zemdegs e*t al.*,2016).

Table 1: Scientific evidence for Western Diets causing mood disorders and associated Health complications

S.No.	Author and Year	Title	Main findings
1.	Kim *et al*.,2013	Impact of High Fat Diet-induced Obesity on the Plasma Levels of Monoamine Neurotransmitters in C57BL/6 Mice.	High fat diet intake for 8 Weeks led to a negative impact on the plasma Serotonin levels and showed a negative association with weight of the Obese subjects. Thus, diet has an impact of the mental wellbeing of humans and the effects can be determined by plasma neurotransmitter levels.
2.	Lee *et al*.,2018	Augmented Insulin and Leptin Resistance of High Fat Diet-Fed APPswe/PS1dE9 Transgenic Mice Exacerbate Obesity and Glycemic Dysregulation.	Mice fed on a high fat diet for 10-week period affected the hypothalamus area of the brain which in turn led to dysregulation of endocrine secretion of hormones like Leptin and Insulin. The shift in energy homeostasis coupled with increased hunger (hyperphagia) and weight gain, depressed mood, increased neuroinflammation finally leading to onset of Alzheimer's diseases.
3.	Zemdegs *et al*.,2016	High-fat diet-induced metabolic disorders impairs 5-HT function and anxiety-like behaviour in mice.	The study conclusively showed that pathologies of Diabetes and Depression are bi-directional and finely corelated (mediated by intake of a High fat Diet) that were characterized by impaired levels of Serotonin in Hippocampus and increased emotional disturbances. Complete reversal of symptoms achieved on withdrawal of HFD.
4.	Yuan *et al*.,2019	Inflammation-related biomarkers in major psychiatric disorders: a cross-disorder assessment of reproducibility and specificity in 43 meta-analyses.	The study stated that calorie dense diets stimulate immune activation leading to cognitive decline, dysfunction of hippocampus, reduction in its size and damage to the blood brain barrier along with increase in all the biomarkers for inflammation.
5.	Ohlsson *et al*.,2019	Leaky gut biomarkers in depression and suicidal behaviour.	Continuous intake of western Diets characterized with increased intake of high fat , refined sugar, salt and low levels of fibre lead to compromised mucosal layer leading to increased gut permeability known as leaky Gut as well as worsening of mood and suicidal ideation.

2.2. Vegetarian Diet

In present times, there have been a big surge in the scientific evidence suggesting that a wholesome vegetarian diet offers many significant advantages in contrast to diets containing meat and other foods of animal origin. Vegetarian diets pattern is defined "as the partial or full exclusion of animal products (with the systematic exclusion of red meat and poultry, and other animal products such as fish, eggs, and/or dairy products, depending on the type of vegetarianism". (Melina.V.,2016). In principle, a

vegetarian diet is a plant-based diet typically characterized by a high consumption of fruits, vegetables, legumes, whole-grains, nuts, seeds and various soy products. The benefits range from lower intakes of cholesterol, saturated fats, animal proteins and higher intakes of dietary fibre, vitamin C and E, carotenoids, magnesium, folic acid, and other phytochemicals. The amount of sugar and salt in vegetarian diet would vary depending upon the processing technique used, which is the case with any other diet of the world. (Rocha *et al.*,2019). The reasons for adhering to a vegetarianism vary as to having ethical considerations, to religious beliefs, cultural characteristics, and concern for environment, to improving health.

Long-term cohort studies in the West, such as EPIC-OXFORD and the Adventist Health study II, show positive Health benefits of a vegetarian diet on cardiovascular, cancer, mental health and overall mortality effects (Beezhold. B.L.,2010). Vegetarian diets are also associated with a reduced risk of ischemic heart diseases, hypertension, type 2 diabetes, obesity, and certain types of cancers. (Baothman *et al*, 2016). A comprehensive meta-analysis reports a significant protective effect of a vegetarian diet versus the incidence and/or mortality from ischemic heart disease (-25%) and incidence from total cancer (-8%). The benefits of a vegetarian diet are mainly related to improving certain metabolic parameters such as oxidation balance, lipid profile, and glucose homeostasis. By practicing a vegetarian diet one can enjoy a healthy immune system, low morbidity, and possibly greater longevity. (Rocha *et al*.,2019). There is a conscious effort in the research fraternity to study mental wellbeing implications of a vegetarian diet.

2.3. Vegetarian diets and its Prevalence

Vegetarianism is gradually but steadily gaining popularity all over the world. A considerable percentage of people thrive on vegetarian diet in countries like USA (3.78%), UK (8.57%), Germany (9.02%) and Italy (9.67%). However, the largest vegetarian community lives in India that is about 35.71% (with a varying percentage of 10-62 in different regions) in contrast to **5%** population of the western world. (Key *et.al*,2006). Vegetarianism in India is associated with many unique characteristics.

Dietary patterns in India are greatly influenced by religious, cultural and family values. These are often maintained as well as adhered for several generations (Agarwal *et* al.,2014). Though, a healthy choice of food items vegetarianism may or may not necessarily be associated with other healthy lifestyle

behaviours, such as increased physical activity. (Rajagopal. M.,2001).

Vegetarian diets practiced in India generally comprises high consumption of whole grains, legumes, nuts and seeds, also milk and dairy products with spices and seasonings unique only to India. Hence, owing to the unique combination of its vegetarian diet, research carried out in the Indian subcontinent may produce different findings than the similar types of studies conducted in the West in a bid to establish a link between the chronic diseases and diet. A plant-based diet devoid of any meat and its products with dairy and its products in it makes it a Lacto-Vegetarian diet. About 25% of the Indian population consumes a Lacto-vegetarian diet and its concentration is more in north Indian states of Punjab and Haryana while Rajasthan and Gujarat rank top in western region. (Mehta.V.,2018)

The lacto-vegetarian diet consumed in India is a traditional diet followed by our ancestors, that has a striking similarity with the Sattvic diet recommended for seekers of ultimate truth. The data from the National Family Health Survey- a survey of 28 Indian states and 7 union territories collects information on a wide range of dietary, societal, lifestyle, and environmental determinants of morbidity and chronic ailments including diabetes besides other things provides valuable information about nutritional status of our population. Agarwal *et al.*,2014 deduced from the data collected in the National Family Health Survey-3(NFHS-3,2005-2006) that population consuming a lacto-vegetarian, had the lowest likelihood of diabetes compared with those consuming non-vegetarian diet after adjustment for several socioeconomic and lifestyle factors.

2.4. Psychology of vegetarian diet

For long vegetarianism has attracted attention from nutrition sciences and philosophy, but the psychological research that explores the eating behaviour has emerged only recently. The psychology of vegetarianism is an upcoming rather blossoming field. It tries to understand and answer questions about how people's attitudes, behaviours, and self-perceptions influence their decision to follow or not follow a vegetarian diet. It is agreeable to all that vegetarianism is often construed subjectively, as no universal definition exists for vegetarian. To add on to this many people may be self - declared vegetarians but consume meat and other meat products. Just as definitions of vegetarianism vary, so do the motivations people have for following a vegetarian diet. Most common among vegetarians' motivations include concerns about animals, health, the environment (Torti.,2017; Wrenn.,2017)) and

religion. When fasting most of the Hindus follow a strictly vegetarian diet as it is associated with bringing peace to mind and body, however the same people would not mind enjoying meat on non-fasting days. Many vegetarians abhor the sight of meat and feel disgusted however an omnivore will not have such issues or may have more positive views about it. Also, an omnivore will or can reduce consumption of meat due to the same health reasons a vegetarian avoids meat for. Further differences exist between vegetarians and vegans, as vegans exhibit stronger beliefs about meat consumption, animal welfare, and the environment. An extensive body of literature on vegetarianism and gender—has highlighted an association between meat and masculinity. When compared to women, men considered meat as an essential part of the diet and were not less bothered about the impact consumption of meat has on the environment. Thus, it is easier to understand that higher percentage of women are vegetarian as compared to their counterparts. (Minson & Monin., 2012).

Many omnivores sight various reasons for not being able to completely adopt a vegetarian diet. Reasons like vegetarian diet offers very less option, has less variety, is less palatable, has high cost involved are very common. Other excuse that availability of vegetarian food is less, and the insecurity of not being able to find a suitable all vegetarian place to dine when one steps out are also often mentioned by meat eaters. Makowski and Roxburgh's (2019) investigated and enlisted compelling qualitative evidence that meat-eaters often show resistance towards embracing vegetarianism. The study revealed meat eaters feared most being stigmatized, and their social relationships impacted on open proclamation to b vegetarianism. However, meat-eaters' proclamations that going vegetarian would be stigmatizing may have reflected post hoc justifications for their eating meat, rather than genuine barriers faced to giving up meat which presumably precede food choice. (Rosenfeld & Tomiyama., (2020).

2.5. Vegetarian diets -- Nutritionally Adequate

There are many doubts about the nutrient adequacy of vegetarian diets, however when compared to omnivore-diets, population-based studies have shown that, vegetarian diets fare much better in term of nutrient density. (Lee *et al*.,2009) The concept of nutrient density is defined by Phillip *et* al. as the amount of nutrient (g or mg) divided by the total number of calories. Vegetarians consume fewer calories and higher amounts of fibres, vitamins A, C and E, thiamine, riboflavin, folate, calcium, magnesium, iron and potassium.

Biochemical assessments of vegetarian populations show consistently high antioxidant concentrations in blood in comparison to their matched omnivore controls, beta carotenoids are consistently raised as well. Vegetarian diets, inherently rich in antioxidants, particularly vitamin C and β-carotene and are associated with lower oxidative stress and lower cytokine concentrations when compared to meat-based diets. (Johnston *et al* ;2017 Haldar *et al*.,2007)

In general, plant-based dietary patterns are associated with a wide range of health benefits. Vegetarian diets (meat-free dietary patterns) are associated with reduced risks of many health conditions. Vegetarians have lower incidence of type 2 diabetes, obesity, coronary heart diseases, and other noncommunicable diseases, and greater life expectancy (Dinu *et al*.,2017). The Academy of Nutrition and Dietetics (formerly the American Dietetic Association) has recognized that a "well-planned vegetarian diet is healthful and nutritionally adequate, being appropriate for human growth development". Vegetarian diets are not only most appropriate for treatment but also for the prevention of many chronic diseases (Melina *et al.*,2017).

2.6. Vegetarian diets and its impact on mood

A growing section of research fraternity is working diligently in establishing a link between adhering to a vegetarian diet and improvement in mood. Indeed, several controlled randomized trials have demonstrated that adopting a vegetarian diet can lead to improved mood. Kahleova *et al*. (2013) conducted a randomised trial with 74 diabetics for a period of 24 weeks. One half of the group was prescribed a lacto-vegetarian diet (plant based diet with whole grain cereal, nuts etc. and a low fat serving of yogurt) with a macronutrient distribution of 60% energy from carbohydrates, 25% from proteins and 15% from fat) while the other half received a standard diabetic low fat diet (less than 30% energy and 20% energy from protein) based on the guidelines of the Diabetes and Nutrition Study Group of the European Association for the Study of Diabetes. After 24 weeks of dietary intervention the mental scores of lacto-vegetarian diet group (54% from baseline) showed a significant improvement when compared to the diabetic group on low fat diabetic diet(12% from baseline). The mental scores were assessed through Beck Depression Inventory. In Another study healthy adult omnivores were randomly assigned to one of the three different diet group -1) the first group was the lacto-vegetarian diet (no animal food with a exception of dairy), second group was pescatarian diet group (no meat and poultry

only fish to be consumed 3-4 times in a week) and third was an Omnivore diet group (chicken and poultry consumed daily). The food frequency questionnaires filled in by the participants showed good adherence to the prescribed diet while information on mental health was sought using Depression and Anxiety State scale and Profile for Mood State questionnaires. The intervention period lasted for two weeks. After the intervention period of 2 weeks, the lactovegetarian group showed improvement in scores for confusion and mental stress. (Beezhold and Johnston,2012). Similarly, depressive symptomology scores of 892 South East Asians residing in America and on vegetarian diet were assessed using Centre for Epidemiologic Studies-Depression Scale (CES-D). The results of the study revealed 43% lower odds for depression in Southeast Asian community who were prescribed a vegetarian diet.(Jin *et al*.,2019). On the similar lines a Taiwanese cohort by Shen *et al*.,2021 (utilised the data of Tzu Chi Vegetarian Study) analysed the vegetarian and non-vegetarian diets to find that compared to non-vegetarian diets, the vegetarian diets showed lower incidence of depression (2.37 vs. 3.21 per 10,000 person-years; adjusted hazard ratio (aHR): 0.70; 95% confidence interval (95% CI): 0.52–0.93). Therefore, food we eat not only gives us energy and nourishes our body it also provides neuro protective agents that help us feel mentally stable, making lacto-vegetarian diet as the most important determinant of health. Having reviewed these studies, it would be most prudent to view vegetarian diets an effective, non-pharmacological adjuvant therapy for boosting one's mood besides conferring all the benefits for physiological health.

2.7. Vegetarian diets, neurotransmitters, and mood

Neurotransmitters are the messengers chemical released by the neurons either in the brain or gut which have the ability to modulate, relay, amplify signals to other cells. (Marc *et al*.,2010). Neurotransmitters like Serotonin, Dopamine, Norepinephrine and Gamma Aminobutyric acid(GABA) are the ones which are involved in the pathophysiology of mood disorders like depression and anxiety. These neurotransmitters can be gut or brain derived and play a very critical role in the development of neural circuits and plasticity. Depletion in the levels of these neurotransmitters can result in the development of depression and other mood disorders.

Serotonin – The Master Neurotransmitter

Serotonin or 5-hydroxytryptamine (5-HT) acts as a hormone and monoamine neurotransmitter.

Serotonin is a key happiness hormone, since it influences our mood, it is essential for keeping depression, anxiety and irritation at bay and makes an individual a social being. As a monoamine neurotransmitter, Serotonin is of vital importance in the Central nervous system (CNS) and Peripheral nervous systems (PNS). CNS contains around 5% serotonin, neurons responsible for serotonin's synthesis are in two small nuclei of Dorsal and Median raphe (DRN&MRN) of the brain stem. Serotonin is present relatively in large quantities in PNS which is around 90%- 95%. Serotonergic neurons as well as (subsets of the enterogastric cells) the Electro chromaffin cells present in the gastrointestinal system produce serotonin where it dons several roles of a hormone, paracrine and autocrine factor. The synthesis of serotonin is totally independent of each other in the CNS and PNS because Serotonin cannot cross the Blood Brain barrier (Sahu *et al*. 2018). Since most of the serotonin is present in the gut, it is synthesised by the diet consumed, light exposure, physical activity, and positive emotional state. Serotonergic neurons help regulate many physiological mechanisms such as appetite, anxiety, aggression and perception besides influencing mood (Abela *et al*. 2020). Intellectual functions like cognition, memory, attention, and learning are also Serotonin dependent (He.et al 2020). Serotonin is involved in maintaining circadian rhythms (Paulus and Mintz.,2016) and stability in respiration. Imbalance of serotonin levels swing mood in a way that it leads to depression and anxiety (Liu *et al*.2020). Thus, Serotonin is one of the most important neurotransmitters influencing mental health. Serotonin levels are reduced in depression, and most modern anti-depressant drugs, known as serotonin reuptake inhibitors *(SSRIs),* act by increasing the amount of serotonin available to brain cells. Inspite of such high dependence on SSRIs for restoring neuropsychiatric functions one third of the patients do not respond to SSRIs. (Zugliani *et al*.2019).

The 5-HT system is considered the most architecturally complex and extensive neurotransmitter system in the mammalian central nervous system (Hainer *et al.,* 2015). Serotonin is also one of the important mediators of inflammation and allergies. It increases the permeability of vessels, the migration of leukocytes in the pocket of inflammation, frees up other mediators of inflammation and allergies. If serotonin is in small quantities, it requires increasingly greater amounts of insulin, so more sugar. On the other hand, one can use sweets or any other foods with carbohydrates to improve mood. Given the relevance of serotonergic neuromodulation for the development of anxiety or depression (Sachs *et al*.,

2015; Caspi *et al*., 2003;),thus control of serotonergic signalling is highly important.

Serotonin Synthesis

Serotonin is synthesised from Tryptophan, an essential amino acid provided by a protein component of the diet. After being absorbed by the gut, tryptophan enters circulation via the large amino acid transporter and can pass through the Blood Brain Barrier to enter brain and synthesize Serotonin in CNS (Le Floc'h *et al*., 2011). Majority of the Serotonin is produced in the gut by Enterochromaffin cells (ECs) cells and is also finds presence in the enteric nerves. (Gershon.2013) Serotonin is synthesised in same way in the CNS and in the gut. The first step in serotonin synthesis involves tryptophan's conversion to 5- hydroxytryptophan (5-HTP) via tryptophan hydroxylase (TPH), the rate-limiting enzyme in the biosynthesis of serotonin. Thereafter, the enzyme Aromatic Amino Acid Decarboxylase (AAAD) almost immediately converts 5-HTP to 5-HT (Berger *et a*l., 2009). Additionally, tryptophan could enter a separate, more dominant metabolic pathway, ultimately being converted to kynurenine via action by Trytophan-2, 3- Dioxygenase (TDO) or the more readily available Indoleamine-2,3-Dioxygenase (IDO).It is interesting to note that approximately only 1% of total tryptophan is available for serotonin synthesis and, and both Serotonin and Kynurenine compete for the available tryptophan which can result in serotonin dysfunction during acute stress (Keszthelyi *et al*., 2012).

Serotonin and diets

Amino acid are required for the synthesis of neurotransmitters and if the diet does not contain adequate amounts of these amino acids, deficiency of neurotransmitters may arise. For eg: stable and sufficient levels of serotonin are implicated in mood, wellbeing and sleep patterns and are derived from the amino acid, Tryptophan (Srikant.N.,2018). Rich sources of tryptophan include nuts, seeds, cheese, and legumes for vegetarians while fish, and chicken are non-vegetarian sources. A well-planned diet which contains rich sources of tryptophan helps to ensure high levels of tryptophan in the blood thereby improving the chances of its crossing the blood brain barrier for the synthesis of serotonin. Schmidt *et al*.,2015 demonstrated a link between the intake of tryptophan and its corresponding levels in the blood plasma. It was found that though vegetarian diets had less amount of tryptophan, higher concentration of tryptophan in the blood of vegetarians were measured as compared to omnivore diets which were loaded with tryptophan. There are other components which can also regulate entry of tryptophan in the brain.

The Large neutral amino acids (LNAA) compete with tryptophan to enter the brain as they have the same transporter. Vegetarians consume diets with a high percentage of carbohydrates which has a direct effect on the levels of insulin in the blood. Insulin is required to enable the uptake LNAA in the muscles after ingestion of meal particularly Branched chain Amino acids, tyrosine, and phenylalanine. This automatically shoots up the Tryptophan: LNAA ratio favouring the uptake of tryptophan in the brain for serotonin synthesis. (Adeva et al., 2012). This suggests that well planned vegetarian diets can easily meet the nutritional requirements of tryptophan and are associated with high circulating concentrations of amino acid tryptophan. Thus, maintaining desirable levels of serotonin in the blood is important as it modulates persons mood. Moreover, the gut-microbiota contributes to the regulation of 5- HT levels in the gut.

2.8. Gut Microbiota

Thanks to the rapid influx of research on the topic of gut microbiota, the understanding about the same is increasing at a rapid pace. The micro-universe of human body is colonized from inside and outside by trillions of most dynamic and diverse microbial communities known as the microbiome comprising bacteria, archaea and eukaryotes, fungi, and virus, their metabolites and their genes. The gene set of the gut microbiota (the gut microbiome) is estimated to be about 3 million genes −150 times larger than that of the human genome . The microbiome populates many parts of the human body like our skin and lungs but its largest collection of over 30 trillion , is in the inner surface of the large intestine where it is referred to as the "Gut Microbiome". (Zhang, *et al.*,2020)

Gut Microbiome is responsible for a vast number of physiological and psychological functions ranging from digestion of food, energy homeostasis, synthesis and release of various vitamins and neurochemicals (neurotransmitters, peptides, amines) it is also responsible for immunity and sleep quality (Sen *et al*.2021).

Gut microbiota plays a pivotal role in various diseases, ranging from metabolic disease like diabetes, obesity (Bliss and Whiteside, 2018; Turnbaugh et al., 2006)) to psychiatric conditions such as depression, anxiety, autism, schizophrenia, ADHD, and Alzheimer disease. (Sheth.H.C.,2021). Thus, from a psychiatric point of view, it is warranted that microbiomes that profoundly affect the brain and various aspects of behaviour can be called psychobiome; similarly, as the probiotics that affect the

functions of mind are called psychobiotics (Matarazzo, 2018; Dinan, & Cryan, 2013).

2.9. Gut Microbiota and mental wellbeing

The various communication channel by which microbiota and the central nervous system (gut-brain axis) associated are through the vagus nerve, the systemic pathway (through the release of hormones, metabolites and neurotransmitters) and the immune system (through the action of cytokines). However, little is known about the mechanics of these pathways. The rich innervation of the gastrointestinal tract enables the exchange of impulse and messages to and fro with the brain. Gut microbiota plays a significant role in modulating psychological wellbeing via the vagus nerve - the longest cranial nerve that extends from the brain to the abdomen. (Wu *et al*.,2021). Vagus nerve is just one of the many routes through which gut microbiota interacts with gut and the central nervous system to influence brain related disorders (Dinan *et al*.,2015). In this context gut microbiota also plays a very important role in maintaining integrity and optimal functioning of the gastrointestinal tract. Depression is a mental disorder wherein the normal gut microbiota is altered also referred to as 'Dysbiosis.' Marked changes are observed in the gut profile of commensal bacteria namely *Firmicutes, Proteobacteria, Actinobacteria* and *Bacteroidetes* in depression patients in contrast to their normal counterparts (Zhang *et al.*,2016). Patients with depression and anxiety show more symptoms associated with gastrointestinal distress than their normal counterparts caused due to the dysbiosis of gut microbiota (Mac Queen *et al*.,2017). Diet has emerged as the biggest (about 50%) and most powerful determinants of the gut microbiota, besides host's genetics, lifestyle and stress. (Moles *et al*.,2020; Turnbaugh *et al*., 2016). Gopinath et al.,2016 reported that diets with high fibre content and that were Mediterranean in nature promoted diverse growth of bacteria in the gut and in turn reduced likely hood of depression.

In addition, consumption of fermented foods containing probiotic strains of bacteria also help modify gut microbiota and in turn cause positive changes in one's mood and mental wellbeing (Aslam *et al*.,2018). Probiotics are defined by the WHO as live microorganisms that are beneficial to human health when adequately supplemented. The potential role of probiotics in treating mental disorders is being increasingly researched as it serves as a novel non-pharmacological therapy with no reported long-term side effects but comparable in efficacy with anti-depressants (Wei *et al.*,2019). In a double blind placebo controlled study with patients suffering with chronic fatigue syndrome, probiotic intervention for two

months with Lactobacillus casei Shirota led to significant rise in commensal bacteria *Lactobacillus* and *Bifidobacterium*) and significant decrease in anxiety symptoms among those taking the probiotic vs controls ($p = 0.01$). Beck Depression and Beck Anxiety Inventories before and after the intervention were filled by the patients for assessing anxiety and depression scores. These results lend further support to the fact that microbes in the gut modulate our gut brain axis and confer benefits to both gut as well mental health.(Rao et al.,2009). A study aimed to examine the effectiveness of Lactobacillus casei strain Shirota (LcS) on gut–brain interactions under stressful conditions. In LcS group there was an induced suppression of salivary cortisol secretion which was attributed to relief of stress-associated physical symptoms in the subjects.(Takada *et al.*,2016).

Mental disorders are increasingly related to the imbalance of neurotransmitters which are effectively modulated by host's microbiota of gut. There exists a trinity between gut microbiota, neurotransmitter and mental wellbeing. There are many proposed mechanisms through which probiotics assert their effect on the nervous system namely through anti-inflammatory effects, restoration of gut permeability, modulation of neurotransmitters, epigenetics and impeding the HPA axis.(Johnson *et al*.,2021) L*actobacillus* and *Bifidobacterium* are the most prominent species of probiotics which are also known to have neurotransmitter enhancing effect namely Serotonin, Dopamine, Norepinephrine and GABA (Gamma Butyric acid) (Yunes *et al*.,2020) The brain-gut axis describes a network that communicates bi-directionally between the two organs where serotonin is a critical signaling regulator that modulates complex physiological functions, including gastric secretion or body temperature control (O'Mahony et al., 2015). Consequently, a serotonin dysfunction in the gastrointestinal system could result in impairments in brain function, such as those involved in mood, sleep, and behaviour (Berger et al., 2009)

2.10. Vegetarian diets and Gut Microbiota

The gut microbiota also show variation in taxonomy, functionality as well as the metabolites produced depending on whether the dietary pattern of the host is vegetarian and omnivore. Diversity and richness also differ between vegetarian and non-vegetarian subjects. A study compared the bacterial composition of Indian adult subjects with their Chinese counterparts and found Indians had up to four times higher *Bacteroidetes* population. Both Indian and Chinese consumed a diet rich in vegetables and carbohydrate. The significant dip in *Bacteriodetes* population was attributed to the heavy load of animal protein in the

diet consumed by Chinese subjects which does not favour growth of *Bacteriodetes*. (Jain *et al.*,2018).). Many studies suggests that a plant-based diet fosters a greater microbial diversity and provides a stable microbial ecosystem. Vegetarian diets, high in plant-based foods, are associated with high abundances of *Prevotella and Ruminococcus*, species of this genus are specialized in degrading complex carbohydrates, such as cellulose and resistant starch, found in plant-based food. These microbes degrade dietary fibres, producing butyrate, which acts as an anti-inflammatory compound. (Klimenko *et al.*,2018). Polyphenols are naturally occurring plant metabolites in plant foods such as fruits, seeds, vegetables, tea, and cocoa products increase *Bifidobacterium* and *Lactobacillus* abundance, which provide anti-pathogenic and anti-inflammatory effects besides cardiovascular protection and improving sleep quality. The benefits of a vegetarian diet are mainly related to improving certain metabolic parameters such as oxidation balance, lipid profile, and glucose homeostasis. There is enough scientific evidence to prove that most of these benefits of vegetarian diets are mediated by bacteria that colonize the gastrointestinal tract. (Rosario. V.A., et al.2016). In contemporary science, the insights of the gut-brain axis have opened a new dimension to the way we understand and treat mental illness which has led to creation of budding branches such as 'Nutritional Psychiatry'. Healthy gut function has been linked to normal central nervous system (CNS) function. Hormones, neurotransmitters and immunological factors released from the gut are known to send signals to the brain either directly or via autonomic neurons. However, Ayurveda has documented the 'body-mind' relationship aeons ago. (Srikant.N.2018)

2.11. Ayurveda – The Traditional system of Dietetics in India

Ayurveda is indigenous to India, it is state recognised system of medicine at par with the conventional medicine. It is the most ancient (dates back to 1500BC), unbroken form of Traditional System of Medicine in India and the whole world. WHO accepts Ayurveda as a Whole System of Medicine that adopts a holistic and multidimensional approach towards health and wellbeing encompassing mind, body, senses and soul. Interestingly enough, extant literature has shown ample evidence that Ayurveda placed prime importance to the proper health and functioning of gastrointestinal tract for individuals' psychological wellbeing as well as overall health. Thus, Ayurveda had proposed a relationship between the gastrointestinal tract and individual's mood, feelings and mental capacity which is strikingly similar to the concept which, the conventional western medicine has been trying to establish since the past few

decades. According to the Ayurvedic principles proper functioning of gastrointestinal tract is synonymous to the term 'Digestive fire or '*agni'* essential for digestion, metabolism, and assimilation of nutrients in the body. Digestive fire has great physiological relevance in proper functioning of the body and providing benefits like strength, longevity, immunity, and lustrous skin. Any disturbance in the digestion power or Agni will lead to formation of toxins or *ama* in the body leading to a diseased state. (Steer.E.,2019). Digestive power can be vitiated through physical factors like faulty dietary practices characterised by increased junk food consumption, inactivity, lack of sleep or any other lifestyle factors which will in turn lead to psychological problems and mood swings. It can be other way round as well where in the negative feelings like jealousy, hatred, insomnia, or stress considered as emotional toxins (*ama*) accumulate in the mind and if not addressed can snowball into various chronic mental disorders like anxiety, neurosis, depression, insomnia, and vitiate digestion process leading to inflammation and increased gut permeability characteristic gastrointestinal morbidities which more than often coexist with mood disorders. Thus, there exists a 'bidirectional communication' channel between the gastrointestinal tract and brain which is well accepted and researched both in traditional wisdom of Ayurvedic Sciences as well as conventional knowledge of Western medicine. Any misalignment in this channel leads to manifestation of mood disorders. This bidirectional channel between gut and brain is mediated through millions of microbes residing in our gut which is why the scientific terminology is referred to as 'gut brain axis' for this communication. Interestingly enough 'Ayurveda, (the origin of which dates back to start of human civilization) also had the concept of microbes and named them as '*Krimi* which may be visible (*Drisya*) or invisible (*Adrisya).* Further to this the Ayurveda used the terms '*Durnam'* and '*Sunam'* for pathogenic and non-pathogenic *Krimi* respectively. (Jain *et al*.,2019). Poor diet and lifestyle choices disturb the delicate balance between *Durnam* and *Sunam krimi* in the gut leading to 'dysbiosis' in medical terminology.

Ayurvedic principles identifies '*Ahara'*(diet) as one of the most important pillars (***Upastambh***) of life that play a vital important role in nourishing mind, soul and the body for achieving health, wellbeing and happiness. Ayurveda examines the whole body, mood and mental wellbeing (behaviour, thoughts and feelings) as a product of the diet consumed. (Sarkar *et al*.,2015). Diet has intimate connection with the mind. Mind is formed out of the subtlest portion of food. According to Ayurveda, the purpose of

food was not merely for bodily strength or to increase longevity but to purify mind and consciousness. According to Ayurvedic principles '*Swastha'* that is health means a trinity of mental, physical and spiritual wellbeing where in one effect the other to maintain the delicate balance of health. In ancient India food was revered as 'God' and alternately it was stated that 'Food is medicine'. In Ayurvedic text *Vaidyajeevanam*, dietary principles of Ayurveda are discussed and it mentions that "the need of taking medicine is eliminated by making wise food choices". Diet and nutrition are increasingly becoming targets for research in mental health because superficially brain, like the rest of the body is also nourished and maintained by the same nutrients consumed in the diet and digested in the gut. Diet (*Ahaar*) has been categorised as *Sattvic, Rajasic & Tamasic* in Bhagvad Geeta (17/8, 9, 10). Food that is Sattvic in nature increases life span, nourishes Sattva, keeps body healthy, increases happiness and prosperity, which are pleasing and full of nutrients, unctuous in nature, providing stability and conducive for the mind, heart and soul. Rajasic food causes sadness, depression, and various diseases. Foul smelling food, unhygienic food, stale, and left-over foods comes under Tamasic food and leads to ill effects on mental health. The importance of food has been studied in all contemporary sciences, but Ayurveda holds clear and scientific explanation in this regard. (Jayasundar.R.,2010)

Ayurveda recommends a *Sattvic diet* one which is basically a lactovegetarian diet, that is plant based, rich in wholesome cereals and grain, fresh, fruits, vegetables, nuts, milk and its products, essential fats, prepared fresh and consumed mindfully in moderation. A *sattvic diet* helps to calm the senses, improve memory, cognition and clarity of thought and does not let depression set in. (Srikant.N.,2018; Chiplonkar and Agte.,2007). *Sattva* attributes means purity which is a spiritual quality. Food that is infused with life, firmness of mind, strength, health, happiness, pleasure, and which is succulent, substantial and agreeable are dear to those in whom the desire for knowledge predominates. Being physically and mentally healthy are most important prerequisite for attaining true wisdom. Ayurveda suggests a sattvic diet for maintaining good health, mind and longevity. Foods that do not disturb the stomach are considered sattvic food. Following a sattvic diet helps a person lead a stress-free life and reduces a person's risk of illness to mental disorders like depression, anxiety, mood disorders, and hyperacidity. People who eat a diet high in whole food such as fruits, nuts, whole grains, legumes and healthy fats are up to 35% less likely to develop depression than those who eat less of these. (Sukesh *et*

al.,2021*)*

There is a growing consensus in the community that holistic practices like Ayurveda which have association with the authentic tradition garner more credibility when backed by solid rational and scientific word. Consequently, sattvic diet does not need to work hard to be represented as rational and scientific, as its entire edifice rests on consuming a prudent diet with whole grains and cereals, incorporating protective foods, like fruits, vegetables, nuts and seeds which are packed with anti-oxidation (Johnston *et al*.,2017) and phytochemicals which undeniably resonates with ideas of modern nutrition. Hence, a sattvic diet is one which promotes peace and harmony in the body and mind as it is a nutrient dense diet (Chiplonkar and Agte.,2007). The sattvic diet is also specified in terms of food being fresh and seasonal; local and organic, which is consistent with the holistic critique of fast-food culture in all industrialised nations across the world. Consuming locally grown, fresh and organic foods as mentioned in Ayurveda reduces dependence on artificial added preservatives which are not considered safe for regular consumption. (Mirza., *et al* 2017). There is a huge influx of studies which associate gut microbiota with health and disease status of the individual. The principles of seasonal regimen followed in Ayurveda helps to modulate and takes care of the dynamic intestinal microbiota and maintains it in right balance for health of the individual (Sukesh *et al.*,2021). Thus, Sattvic diet itself is by far the most scientific one which strikes a balance between the three qualities of experience, tradition, and reason.

Table 2: Scientific evidence in support of Sattvic and Lacto-Vegetarian Diets

S. No.	Reference	Title	Major Findings
1	Chiplonkar and Agte.,2007	Linkages of concepts of good nutrition in yoga and modern science.	The micronutrient density of a **lactovegetarian or Sattvic diet** was positively associated while low amounts of fat and higher amount of fibre. On the other hand, micronutrient density of the Tamasic diet was lowest with highest amounts of Fats in it. Consumption of **Tamasic diet** also leads to **statically high scores of anxiety.** Thus, reinstating the relationship between mind, body and diet.

2	Toress and Nowson.,2012	Moderate-sodium DASH-type diet improves mood in postmenopausal women	Depressed postmenopausal women prescribed a healthy plant-based diet showed lower **POMS scores**, for confusion and lower urinary excretion **of sodium** when compared to their counterparts who consumed diet containing some amount of red meat.
3	Kahleova.,2013	Vegetarian diet in type 2 diabetes–improvement in quality of life, mood and eating behaviour	10 Weeks of intervention with Lacto - vegetarian diet, led to improved scores of depressions using POMS in those who were suffering with diabetes.
4	Agarwal et al.,2014	Type of vegetarian diet, obesity, and diabetes in adult Indian population.	A large nationwide study found out that prevalence of diabetes was lowest among **Lacto-vegetarians** followed by Lacto-ovo vegetarians, Semi vegetarians and highest amongst Pesco – vegetarians in India.
5	Johnston.,2017.	Vegetarian Diet and Possible Mechanisms for Impact on Mood.	Blood Vitamin C concentrations are reported to be 50% higher in vegetarians compared to meat eaters. Vegetarian diets, inherently rich in antioxidants, particularly **vitamin C and β-carotene** and are associated with lower oxidative stress and lower cytokine concentrations when compared to meat-based diets.

2.12. Meditation

The Ancient Vedic Sciences of India had documented aeons ago that- Spirituality is for every individual, and it is innate to all. As per Abraham Maslow, the American Psychologist who proposed Maslow's model of man's need believed "Spirituality to be one's essential need." Meditation is one of the various paths that people of different countries, culture, societies, and communities adopt to fulfil their spiritual needs. The main purpose of meditation is for individual's spiritual growth, the mental and physical benefits that are experienced by regular practice of meditation are just the by-products of it (Buttle H.,2015). The word meditation stems from *meditatum*, a Latin term 'to ponder. Meditation is a mind-body practice which is an integral part of the complementary and alternative medicine (Rai A K.,2020). Alternate medicine involves a different holistic approach towards disease, its prevention and treatment encompassing the trinity of mind, body and spirit. (Qureshi & Al-Bedah,.2013). Most meditative techniques started in eastern religious or spiritual traditions. Indigenous to India, most of the meditation practices originated in the Vedic times. In Indian culture, meditation is prevalent in India from past centuries in the names of Tap, yoga, Dhyaan, asana, siddhi, and Samadhi. (Jindal.V.,2013). Meditation is one of the modalities used in Ayurveda (Science of Life), the comprehensive, natural health care

system that originated in the ancient *Vedic* times of India. As per Ayurveda, mind, body, and soul should be in perfect synchronization for overall health. Sharma H., in 2015 has stated that according to Vedic science or eastern philosophy, meditation is to connect oneself to one's deep inner self or soul. Ancient Vedic texts describe meditation as the experience which reduces stress and bring increased creativity and efficiency to the functioning of inner faculty. The process of meditation goes beyond the mind to the deepest level of the inner self. Thus, meditation caters to one's soul and addresses one's spiritual needs. It helps in overall health and well-being. More than 60% of the Indian population directly or indirectly, practices meditation as part of their traditional culture. In India, schools offer courses in Yoga and Meditation. Knabb *et al*. (2018) mentioned that meditation helps to improve one's relationship with god.

Although, the practice has ties to many different religious teachings however increasingly in modern times meditation is less about faith and more about altering consciousness, finding awareness, and achieving peace. Though, prevalent in every culture and every religion and known for a plethora of benefits, common definition of meditation is still elusive. A general definition agreed upon for, meditation is, "a mental training where calming the mind is most essential to achieve the goal of detached observation" (Saeed S.A.,2019). Meditation is also stated to be a unbroken flow of thought toward the object of concentration. (Rai A K.,2020). There are many types of meditation practices, some of the well-known practices in East are "open concentrating Meditation", "Transcendental Meditation" and "Kundalini Meditation" and in the contemporary world the term meditation refers to a group of techniques, such as mantra meditation, Zen Buddhist meditation, open meditation, and focussed meditation. Irrespective of the type there are benefits associated with every kind of meditation.

2.12.1. Types of meditation

All the main types of secular meditation can be grouped into three:

- Open Monitoring: Open monitoring or mindfulness-based meditation involves nonreactive observation of the content of ongoing experience, to become reflectively aware of cognitive and emotional patterns. (Raffone A., & Srinivasan, N.,2009). OM meditation is also referred to as mindfulness meditation.
- Focused Attention: In focused attention meditation, attention is focused and sustained on a particular

object and brought back to the object when the mind has wandered. Thus, the meditator is controlling one's own attention (Raffone A., & Srinivasan, N.,2009).

- Automatic Self-Transcending: Automatic self-transcending meditation involves a particular mantra that the meditator can attend to without effort or concentration, with the aim of the mantra becoming secondary and ultimately disappearing as self-awareness increases. In this meditation the mind should be free from focus and mental effort

2.12.2. Meditation for holistic wellbeing

Mounting evidence supports the idea that meditation changes more than one's mental health. Evidence suggests that meditation has neuroprotective properties that has implications for enhancing cognition and delaying neuro degenerative changes. (Horowitz S., 2010) It changes the neurophysiological structure of the physical brain (Siegel, 2020). The regular practice of mindfulness meditation leads to positive changes in the structure of the brain resulting in better processing overall (Siegel, 2020; Fox *et al*., 2014). A study on the effect of meditation on the executive attentional network found that meditators were faster on all tasks. (Chan D. & Woollacott M., 2007). Orme-Johnson D.W.,2014 produced robust evidence suggesting that the practice of meditation drastically reduced depressive and anxiety symptoms; and healed symptoms of post-traumatic stress disorder effectively (Banks *et al.,* 2015). There are several studies which support those sustained efforts of meditation practitioners to modulate attention, arousal, and emotional responses could change the underlying neural circuitry in the thalamus, hippocampus, orbitofrontal cortex, and brainstem. (Craig, A.D.,2009). Brain scans in the resting state showed that the activity in the brain region related to self-control increased in the subjects of the meditation group. (Tang *et al.,*2010) With aging, cortical thickness of brain (gray matter, which contains neurons) decreases, whereas meditation experience is associated with an increase in Gray matter of the brain. (Luders E. *et.al*,2009).

Practice of meditation helps the person to get trained in interoceptive processes. The limitation with interoceptive process is that it cannot be directly observed during practice because they are internal and fluctuate among various states of attention or inattention to the body (Van Dam et al., 2018). A study on the effect of meditation on the executive attentional network found that meditators were faster on all tasks. (Chan D. & Woollacott M., 2007). However, meditation with potential neurobiological changes

is only one aspect of holistic well-being.

Physiological benefits of meditation are also numerous. Continuous practice of meditation is known to reduce blood pressure, stress and epinephrine and cortisol levels in the body. The heart protective benefits of meditation include reduction in cholesterol, heart rate, lactate and meditation is often known to help in quitting smoking habit. Meditation also showed desirable outcomes with the oxygen utilisation and decrease in the carbon dioxide levels. Meditation practices also regulate the levels of neurotransmitters like serotonin and melatonin in the body leading to upliftment of mood.

An intervention study carried out with six-week meditation course helped the subjects suffering from long term conditions to learn mindfulness skills. Practicing these skills helped them to get improved sleep, greater relaxation, and more-accepting approaches towards illness and illness experience. There was also significant reduction in the thought suppression and worry. (Keyworth.C., 2014). In 8 weeks of meditation training, long term vegan subjects were able to effectively relieve anxiety, depression, and other adverse mental states. It was inferred that by regulating the structure and function of the central nervous system, meditation training may affect the gastrointestinal tract through the downregulation system of the "bacteria-enteric-brain" axis, leading to a series of positive changes in the intestinal flora. The same study also highlighted that long term meditation practice helps in building immunity and has a desirable impact on the endocrine and metabolic levels.

Meditation is therefore found to provide multifaceted and holistic regulation of the body, enabling the body to reach a state of good health. (Jia *et al.*,2020)

2.12.3. Meditation, Endocrine system and Chakras for holistic wellbeing

These desirable effects of meditation practices appear to be mediated through an interaction between the autonomic nervous system and endocrine system, wherein secretion of different hormones may be playing an important role. (Jindal.,2013) The evidence available indicates that changes associated with endocrine function following meditation correspond with improvements in mental health. (Sakshi.,2020).

The endocrine system consists of a number of glands: the hypothalamus, pituitary gland, and pineal gland in the brain; the thyroid and parathyroid glands in the neck, the thymus in between the lungs, the adrenal glands on top of the kidneys, the pancreas behind the stomach, and the gonads in the pelvic

region; these produce hormones that regulate many functions in the body and are important in managing the and responding to stress. Chemical messenger system comprising of feedback loops egulated by hormones released by glands into the circulatory system to regulate distant organs, often mediated via the hypothalamus and pituitary It is rather interesting to note that all the major hormone secreting glands are strategically placed on or around the ***'Chakras*' or energy centres of the body** and thus, activated in a positive way to further contribute in conferring the physical and psychological benefits of meditation. According to Hindu Scriptures, Chakra verbally means "Wheels of light". These chakras have a centre of electromagnetic energy that are located throughout the body, they provide a way for energy to enter and leave our body and help to regulate all type of energy flow i.e. physical, mental, emotional and spiritual. According to yogic sciences our body has seven major and many minor chakras. These seven chakras are situated from base of spine to the top of head. The energy centres are located at the various anatomical structures of the human body which are directly connected with unilluminated centres of the brain. During meditation, yogic postures, pranayama, and chanting these centres are stimulated, while activation of these enters, practitioners undergo vivid spiritual experiences — each energy centre corresponds to a specific spiritual experience (Niranjanananda-Saraswati, 2002). Chakras are not in the physical entity; they are in energy form., thus not visible or seen during western dissection of the human body, these chakras cannot be located. These chakras are mooladhar, swadhisthan, manipur, anahat, visudhdhi, ajna, and sahasarar, (Satyanand-Swaraswati, 1996).

2.12.4. Meditation and neurotransmitters

Meditation and its different techniques are receiving increased attention all over the world, due to the accumulation of evidence-based research that proves the direct and indirect benefits of such practices. The benefits of meditation are well documented, but the biochemical mechanisms have not been fully identified. One effect mechanism may be via influence on **neurotransmitters**. (Solberg *et al.*, 2003)

Based on studies conducted so far, it has been found that the practice of meditation triggers neurotransmitters that modulate psychological disorders such as anxiety and depression. (Krishnakumar D.,*et al* 2015)These effects of yogic practices appear to be mediated through an interaction between the autonomic nervous system and endocrine system, wherein pineal secretion of melatonin may be playing an important role. Melatonin is derived from another neurotransmitter Serotonin. Neurotransmitter

melatonin and serotonin influence mood states and are essential for many other biological functions in the body (Steer E.,2019). **Low levels** of these neurotransmitters are commonly observed in depressed episodes, schizophrenia and other mood disorders. (Cryan *et al*.,2017) Many researchers have demonstrated increase in the blood levels of neurotransmitters like noradrenaline, (Lang et al., 1979), Melatonin (Tooley *et al*.,2000) and Serotonin metabolites in urine (Bujatti and Riederer.,1976; Harinath.,2004) after the session of meditation.

2.13.5 Ayurveda and Association between Diet and Meditation

Ayurveda is a comprehensive, natural and traditional health care system that originated in ancient *Vedic* times of India. Diet *(Aahar)* and Meditation *(Vihaar)* as the two most important modalities used in Ayurveda (Science of Life) to promote holistic wellbeing. According to principles of Ayurveda, the purpose of food was not merely for bodily strength or to increase longevity but to purify mind and consciousness. Ayurveda considers the development of **consciousness** to be essential for optimal health and mentions **meditation** as the main technique for achieving this (Sharma *et al*.,2007). **'***Moksha*' according to Ayurveda is one's spiritual pursuit (salvation or liberation of the 'soul' through spiritual pursuits, in old age). Moksha is one of the *Chaturvidha purushārtha* or four goals that must be achieved during one's lifetime. To attain this four-fold purpose of life, Ayurveda considers it essential, for a human being to be in a best of physical, mental and spiritual wellbeing. (Banamali.,2014).

Ayurveda is a part of one of four treatises or Vedas. Traditional foods of India and their scientific study, from a nutritional perspective has its roots even in the Vedic era. Food is also called "*Mahabheshaj*," which means "the biggest medicine." There are elaborate references available in the classical texts of Ayurveda from 300 BC to 700 AD that are dedicated to sections on food. According to the yogic concept of nutrition, food has been categorized as Sattvic (pure), Rajasic (over-stimulating) and Tamasic (dull) with respect to its effect on the body and mind. Sattva is the contented state, rajas an excited state whereas tamas relates to a lethargic disposition, that is, foods can induce these states in the mind. The classification primarily also takes into consideration the appropriateness of food based on individual's body and mental constitution considering the five elements (*Panchamahabhuta)* and the *Tridosha* theories. Ayurvedic dietary principles recommend a Sattvic diet (which is a pure vegetarian diet with dairy component in it.) basically a Lactovegetarian diet in modern parlance for any seeker of knowledge

who has the desire to raise his consciousness. ***Sattvic diet*** (devoid of any meat and meat products) contains all the necessary components for nurturing the body, calming the mind and improving one's mood. The extant ancient scriptures have stressed since aeons that diet not only impacts one's mind and body but also the ability or the caliber to meditate. Tamasic diets are heavy diets which stimulates the entire body and disturbs the calmness in mind. Tamasic diet increases inertia and dullness and renders it unfit to concentrate and focus thus making body and mind incapable to carry out meditation. Thus, prudent food is one of the main determinants which can make one's meditation practice successful and thus allows the individual to reap the benefits of mental and physical wellbeing associated with meditation as well as make progress towards spirituality.

3. Rationale of study

The burden of chronic lifestyle diseases and common mood disorders such as depression and anxiety are on a steady rise. The growing prevalence of these health conditions is alarming as it has a huge impact on the overall quality of life. In the present scenario it is imperative to explore public health methods which can effectively tackle the situation and improve people's wellbeing.

Diet, amongst all the lifestyle factors, has emerged as the biggest modulator of individual's mental and physical wellbeing.

- It is a cost effective, non-invasive, and non-pharmacological way of managing, treating as well as preventing the onset of many chronic diseases and mood disorders.
- This holds true especially for traditional India's lacto-vegetarian diets or ***Sattvic diet*** (devoid of any meat and meat products) which **contains** all the necessary components for nurturing the body, calming the mind and improving one's mood.

Although it is well documented in our ancient scriptures that diet has a huge impact not only on individual' body and mind but also on the calibre of performing meditation, modern science has not explored it enough to approve or disapprove it. Having worked for 1.5 decades in the dietician fraternity, the researcher is keen to take up the proposed study which gives an exciting opportunity to explore the effect of diet on mood and meditation.

4. Statement of problem

The Effect of Lacto-Vegetarian Diet with special reference to Sattvic diet on Mood And

Meditation Practices.

5. Objectives of study

The main objectives of the proposed research are:

1. To study the effect of diet with special reference to Sattvic Diet on the act of meditation of the subjects.

2. To monitor and assess the diet induced changes on the physiological health and subjective wellbeing (psychological and emotional health) of the subjects.

3. To assess the effect of Probiotic supplementation on the physiological health and subjective wellbeing (psychological and emotional) of the subjects.

6. Operational definitions

- **Effect:** cause(something) to happen or bring about.
- **Lacto-Vegetarian Diet:** A plant - based dietary pattern (excluding all types of animal food and products with the exception of honey, milk and its products) of food a person or a community habitually consumes or eats. The term Lacto-vegetarian diet helps to distinguish it from other type of vegetarian dietary pattern for example veganism.
- **Mood:** Mood of an individual is the collection of different feelings one experiences at any given time or situation. When negative mood persists for more than two weeks it leads to mood disorders characterized by feeling of sadness, lethargy, worthlessness, fatigue and in extreme conditions suicidal ideation. Depression and anxiety are the common mood disorders referred to in the study.
- **Meditation Practice:** Meditation is a mental training where calming the mind is most essential to achieve the goal of detached observation (Saeed, S.A.,2019). Meditation is also stated to be an unbroken flow of thought toward the object of concentration. (Rai A K.,2020).

7. Research methodology

Research methodology is a way to resolve the research problem methodically and scientifically. It may be implicit as a science of studying how research is done systematically. Therefore, methodology is the catalogue of the entire research work. This is a description of the actual procedure to be followed by the researcher with a view to collect data and analyses them to draw conclusions in the light of aims formulated for present research work.

Research methodology used in the study is presented in the following sections: -

- **Variables:** The variables of the present study are categorized as follows:

Independent Variables: Diet

Dependent Variable: Meditation and Mood, Physiological and Psychological wellbeing of the Subjects.

- **Locale of the study**: The Locale of the Study will be chosen conveniently as the city of Bengaluru, Karnataka.

- **Research Design:**

- Sampling Design: The respondents for the study will be selected as per the detailed methods given below:

-Sampling Technique: Purposive sampling method will be used for the present research work. Reputed Yoga and Health centres in the North Bengaluru will be contacted to help out in enrolling subjects for the proposed study. Both healthy male and female subjects in the age range of 35 to 60 years will be enrolled.

-Size of the sample: A total of 100 Subjects will be enrolled for the research.

Table 3: Stages of Sample Selection

Stages of Sample Selection	
Stage 1	For conveniences sake North Bengaluru city will be selected for the proposed research.
Stage 2	Yoga centres and Health clubs in North Bengaluru city area will be enlisted and contacted for exploring the possibility of obtaining samples from their respective centers.
Stage 3	Five Yoga centers and five Health clubs will be purposively selected (with at least 50 enrolled people in each will be chosen for the study).
Stage 4	Email address and contact details of the perspective subjects (35-60yrs) will be sought from the Yoga centers and Health clubs. Subjects will be contacted over phone and emailed to seek their consent for being a part of the proposed research.
Stage 5	Having received informed consent from the respondents, self-reporting questionnaire (in a google form format) about food preferences and meditation practice will be mailed to them.(Three gentle reminders will be sent to the proposed subjects in a span of 1 week, requesting to mail back duly filled in questionnaires.).
Stage 6	Once all the filled in questionnaires are received, depending upon the dietary preferences of the subjects (weather vegetarian or non-vegetarian food) two broad groups of Lacto-Vegetarian (LV) and Non-Vegetarians (NV) will be respectively formed. The respondents from the Yoga center will form the **Experimental group.**
Stage 7	The respondents from the health centers will form two **Control groups**. One will be non-Vegetarian control group, while other will be Vegetarian Control **group.**

	Once Lacto -Vegetarian and Non-Vegetarian groups are formed with their respective control groups, the process of sample collection will be completed.

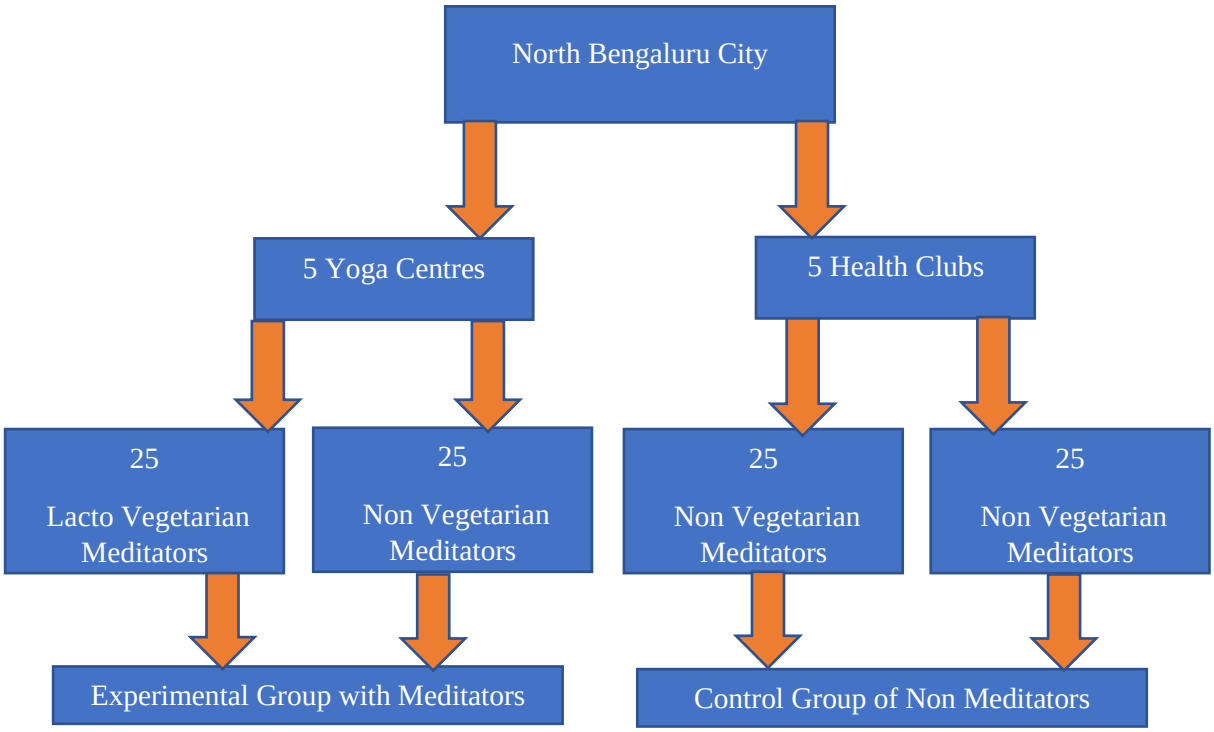

Figure 1: Sample Selection

Research Tools: The details of the questionnaires to be used for collecting data from the subjects provided in the tabulated form below in the Table No: 4.

1.Computer based application will be developed in house by the researcher and installed on the smart phones of the subjects to continuously monitor their dietary intake and Sattvic components of the diet. The details regarding the Adherence to daily Meditational Practices will also be sought by the subjects in an input-based manner.

2.Physiological health variable: The following parameters will be assessed for the physiological health variable.

- **Anthropometric measurements:** The following Anthropometric measurements will also be taken for the subjects:

- **Height** will be measured by making the subjects stand erect without footwear on the foot pad of the Stadiometer and then the upper headboard of the stadiometer is lowered to touch the head of the subject to take the reading.

- **Weight** is measured on the digital weighing balance which is portable and can be easily carried anywhere.
- **BMI will be calculated by dividing square of height (in metres) with weight in kgs.**
- **Waist to hip ratio** will be measured by running a non - stretchable tape over the navel of the subjects and the reading will be taken in centimetres.
- **Blood pressure**: Blood Pressure will be measured on the digital blood pressure machine.
- **Pulse rate, Caloric expenditure, and number of hours of sleep** will be tracked by a health tband worn on the wrist of the subjects.
- **Count of infectious disease** episode during the period of study.
- **Morbidity profile** of the subjects will be assessed using a structured questionnaire.

3. Psychological health: Happiness and Mood state of the subjects will be assessed to gain understanding about the psychological state of the subjects.

- **Happiness-** Will be measured by using the Oxford Happiness questionnaire. It is a self-administered questionnaire containing 29 statements which are measured on a 6 Likert scale.
- **Mood-** Profile of Mood Questionnaire-2 will be used to collect information about subjects' mood. It will evaluate person's current mood using 7 subscales based on different mood state-anxiety, depression, fatigue, anger, confusion, vigor and self-esteem. It contains 65 statements measured on 4 Likert scale.
- **Neurotransmitters in Urinary Sample:** Urinary samples will be collected from a subset of sample. The 5HIAA (5 hydroxy Indole Acetic Acid is an end product of serotonin metabolism excreted in the urine. It will be measured using reverse phase high performance Liquid Chromatography (HPLC).

4. Probiotic Milk Based Fermented Drink For Intervention- Yakult will be provided to the subjects for a period of one month. One bottle of Yakult contains 65 ml of the probiotic liquid with 10^9 CFUs of Lactobacillus casei Shirota. One drink per day will be provided to the subjects for a period of one month.

Table 4: Proposed Parameters and Tools for the Research .

S.No.	Objectives	Parameters to be Assessed	Proposed Tools
1.	a) Diet Preferences	Type of diet consumed (Lacto-vegetarian or Non vegetarian.	Food Frequency Questionnaire.
	b) Sattvic Diet Component.	Diet Quality and Frequency of consumption w.r.t Sattvic foods.	Food Frequency Structured Questionnaire.
	c) Details of Meditation Practices	Type, frequency, and Duration of meditation Practiced or not	Semi Structured Questionnaire
2.	Physiological Wellbeing	Anthropometric Measurements (weight, height waist to hip ratio, waist Circumference, BMI)	Omron Weighing balance, Stadiometer, Non- stretchable measuring tape.
		a) Blood Pressure	Omron Digital Blood Pressure Monitor.
		b) Pulse Rate	Wrist Band (e.g., Fit bit).
		c) Sleep	Wrist Band
		d) Caloric expenditure	Wrist Band
		e) Morbidity Profile	Structured Questionnaire
3.	Psychological Wellbeing	a) Happiness	Oxford Happiness Questionnaire (OHQ*; Argyle and Martin ;2005)*
		b) Mood	Profile of Mood Questionnaire (POMS; McNair. M.P *et al; 1981*
		c) Neurotransmitter Metabolite Levels.(5 HIAA- subset sample)	ReversePhase High Performance Liquid Chromatography (Mulder *et al;* 2005)
4.	Adherence to Meditation	Frequency, duration, comfort level, subjective relaxation, enjoyment experienced and Willingness of practicing meditation.	Daily tracking through Application based Questionnaire.
5.	Probiotic Drink Supplementation	Physiological and Psychological Wellbeing	One Yakult drink to be consumed each day (65 ml of drink containing 10^9 CFUs of Lactobacillus casei Shirota.)

Proposed Schedule of data collection

The study will be divided into four phases of data collection. The data collection plan proposed for four phases of data collection will be:

Phase 1: of data collection will involve the collection of data with respect to the food preferences of the subjects, based on which they will be divided into lacto-vegetarian group and Non vegetarian group.

Phase 2: Will involve baseline data collection about the participant's Demographic Profile, Socio economic data, Anthropometric measurements, Morbidity profile, Current Dietary Practices, Activity levels, and Meditational Practices and Physiological health and psychological health. The data will be collected over a period of one month.

Following baseline data collection, focussed meditation training will be held for the Experimental group for a period of one week. Thereafter Experimental group will follow the practice of meditation for next five weeks in their homes.

Phase 3 : Data collection will involve collection of data after a gap of around 10 weeks from phase one. Data for the same parameters will be collected as was done in phase one.

After the third phase of data collection, the experimental group will be given intervention with Probiotic drink for a period of one month .

Phase 4 : of data collection will start immediately after the intervention period ends and data will be collected for the same parameters as was done in phase 1.

The different stages of data collection are consolidated in table no: 4 given below.

Table 5: Proposed Schedule for Data Collection

Data Collection Plan	Data to be Collected
Prior to Baseline Data Collection	
Phase 1:Identifying Respondents and Dividing them in Lacto-Vegetarian(LV) , Non-Vegetarian Group (NV) and Control groups.	• Self - Structured Questionnaire in the google form format about dietary preferences and assessment of dietary intake, Data about meditation practiced.
Subsequent Week Orientation Session about the Research will be held for the respondents	
Phase 2: Baseline Data Collection (Week Zero- Week 4)	• Participants Demographic Profile, Socio economic data, Anthropometric measurements, Morbidity profile. • Current Dietary Practices, Activity levels, and Meditational Practices. • Physiological health and Psychological health
Focussed Meditation Training session for all those in experimental group(LV+NV) will be held or a period of one week that is 7 sessions. Controls will not be part of the training session.	
At Home Meditation Practice for 20 minutes twice daily for a period of 6weeks (5+1)	
Phase 3: Data Collection (After 10-16 weeks)	• Anthropometric measurements • Morbidity profile • Current Dietary Practices and continuity of Meditational Practices • Physiological health and Psychological health
Intervention With Yakult Probiotic Drink for four Weeks	
Phase 4 : Post Intervention Data collection (After 20 weeks-week 24)	• Anthropometric measurements • Morbidity profile • Current Dietary Practices and continuity of Meditational Practices • Physiological health and Psychological health

Statistical Analysis:

The data collected will be coded, tabulated and analyzed using the various statistical techniques. In the proposed study the below mentioned statistical techniques are planned to be used.

Table 6 : Proposed Statistical Analysis for Research

S.No.	Statistics	Technique
1.	Descriptive	Percentages, Arithmetic Mean, Standard Deviation
2.	Inferential	Regression
Further Analysis of the data will be determined based on the type and nature of data obtained.		

8. Delimitation of the proposed study

- The study will be restricted to North Bengaluru city only.
- Respondents selected will be in the target age group of 35 -60 years only.
- It is mandatory for the respondents to have a smart phone.

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